

PATENT ABSTRACTS OF JAPAN

(11)Publication number : 07-199829

(43)Date of publication of application : 04.08.1995

(51)Int.Cl.

G09F 9/33

F21V 19/00

H01L 33/00

(21)Application number : 05-335260

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(22)Date of filing : 28.12.1993

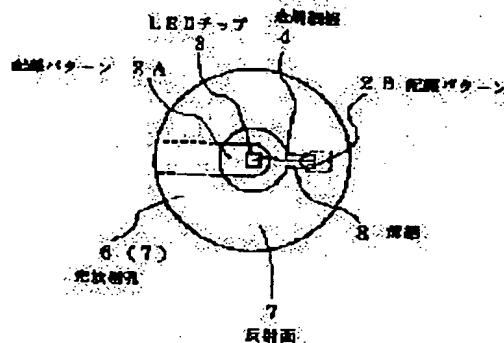
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(54) LIGHT EMITTING UNIT AND DISPLAY DEVICE AND ILLUMINATION DEVICE

(57)Abstract:

PURPOSE: To improve brightness and luminance by efficiently radiating incident light on a reflection surface from LED chips from an aperture of a housing.

CONSTITUTION: This light emitting unit U has a wiring board 1 disposed with plural pieces of the LED chips 3, 3,... on wiring patterns 2A in a linear or matrix form and the housing 5 provided with the light radiation holes 6 in correspondence to the respective LED chips 3, 3. The light radiation holes 6 are formed to a truncate conical form or truncated pyramidal form and the apertures thereof on the substrate side are sized to enclose the LED chip parts 3 and are successively provided with groove parts 8 for wiring fine metallic wires 4 to be connected to the other wiring patterns 2B. This display device or illumination device is constituted by using this light emitting unit U. These devices are constituted to lessen the loss arising from repetition of iterative reflection of the light radiated from the LED chips 3 by the peripheral wall surfaces of the radiation holes 6. The quantity of the light radiated from the light radiation holes 6 or light radiators, the luminance, etc., are thus enhanced.



LEGAL STATUS

[Date of request for examination] 30.08.2000

[Date of sending the examiner's decision of rejection] 03.12.2002

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number]

[Date of registration]

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CLAIMS

[Claim(s)]

[Claim 1] In the luminescence unit possessing the wiring substrate which arranged two or more LED chips the shape of a straight line, and in the shape of a matrix on the circuit pattern, and housing which was made to correspond with each LED chip on this wiring substrate, and prepared the luminous-radiation hole The above-mentioned luminous-radiation hole is a luminescence unit characterized by forming successively the slots for the metal thin line arrangement connected to the circuit pattern of another side as if opening by the side of the substrate is magnitude which surrounds the LED chip section nothing for the shape of the shape of a truncated cone, and a truncated pyramid.

[Claim 2] The wiring substrate which arranged two or more LED chips the shape of a straight line, and in the shape of a matrix on the circuit pattern, In the luminescence unit possessing housing which was made to correspond with two or more LED chips which carried out the serial on this wiring substrate, and established the gutter-shaped luminous-radiation object The cross section by the side of a shorter side the above-mentioned luminous-radiation object the shape of the shape of a truncated cone, and a truncated pyramid It is the luminescence unit characterized by forming successively the slots for metal thin line arrangement connected to the circuit pattern of another side from each LED chip with the continuous long body to make as if the opening width of face by the side of the substrate is magnitude which surrounds the LED chip section near each LED chip.

[Claim 3] The extension include angle theta of the luminous-radiation hole of the shape of the shape of a truncated cone formed in the above-mentioned housing and a truncated pyramid is a luminescence unit characterized by being 20 - 100 degrees.

[Claim 4] The display characterized by providing the current-limiting circuit by which series connection was carried out to 1 set thru/or two or more sets in the luminescence unit indicated by either claim 1 thru/or claim 3 at this luminescence unit.

[Claim 5] The display characterized by providing the flashing drive circuit which this luminescence unit is connected [circuit] with 1 set thru/or two or more sets for the luminescence unit indicated by either claim 1 thru/or claim 3 at an output side, and makes two or more LED chips turn on alternatively.

[Claim 6] The lighting system characterized by providing the current-limiting circuit by which series connection was carried out to 1 set thru/or two or more sets in the luminescence unit indicated by either claim 1 thru/or claim 3 at this luminescence unit.

[Claim 7] The lighting system characterized by providing the flashing drive circuit which this luminescence unit is connected [circuit] with 1 set thru/or two or more sets for the luminescence unit indicated by either claim 1 thru/or claim 3 at an output side, and makes two or more LED chips turn on alternatively.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Industrial Application] This invention relates to the luminescence unit which performs a display or lighting of an alphabetic character, a figure, an image, etc. using light emitting diode, the display using this luminescence unit, and a lighting system.

[0002]

[Description of the Prior Art] For example, it replaces with an electric bulb as the light source of a lightning display, and what was moreover used as long lasting light emitting diode (LED is called hereafter.) strong against vibration resistance by the small (thin shape) light weight, low power, low generation of heat, and the low price is being used abundantly.

[0003] In the lightning display, for example, the traffic information plate etc., using this LED etc. For example, the dimension beside vertical x constitutes a luminescence unit by using as one module what has arranged a total of 81 LED chips in every direction nine trains of nine lines in the shape of a matrix to the substrate which is 5cm of about 5cmx abbreviation. It is made to make display offer of the traffic information required for passing by attaching in a frame etc. this luminescence unit that carried out the modularization in all directions furthermore in the shape of a ten sheet x 20-sheet matrix, energizing for a predetermined LED chip and switching it on through a lighting control circuit.

[0004] It seemed that and the configuration of this luminescence unit U was conventionally shown in drawing 1 (the appearance was used since it was the same as the former although drawing 1 was the example of this invention.), and drawing 9. That is, the LED chip which the circuit pattern, 3 and 3, and -- (a drawing top is shown in drawing 9 one piece.) in which the wiring substrate with which 1 consists of synthetic resin of electric insulation in drawing 1 and drawing 9, 2A, and 2B were formed on this substrate 1 separated predetermined spacing on this circuit pattern 2A, and formed, and 4 are metal thin lines which have connected this LED chip top face and anode circuit pattern 2B.

[0005] Into the part which meets each LED chips 3 and 3 which 5 is housing fixed on this substrate 1, and were formed on circuit pattern 2A of the above-mentioned substrate 1, and --, moreover, septum 6c, The luminous-radiation hole 6 which was divided by 6c and -- and to penetrate is formed, the peripheral wall of this luminous-radiation hole 6 is the inclined plane which carried out the shape of a truncated cone with the larger path by the side of upper part opening 6a than a substrate 1 side, and this inclined plane is the reflector 7 which carried out whitening etc. And when [of each luminous-radiation holes 6 and 6 and --] it is in a medial axis and the LED chip 3 is turned on, as for each above-mentioned LED chips 3 and 3 and --, the synchrotron orbital radiation is efficiently emitted out of housing 5 through a reflector 7.

[0006] There is little power consumption, there is a luminescence unit U of such a configuration, it is long lasting, and maintenance control has the advantage of becoming easy, and vibration resistance also has the request of wanting you to make it further easy to make brightness high and to identify it from the operator of a car etc.

[0007] Although this is being able to say to the plotting board at large When, as for the information-display plate installed especially in the outdoors, sunlight has hit the screen under

the environment where a fine weather day is bright, High brightness-ization which the brightness ratio of the screen falls for the sunlight which carries out incidence, a display stops being able to be visible easily, check-by-looking persons, such as an operator of a car, may be able to stop being able to check the contents of a display by looking, and the display of the screen can identify clearly is desired.

[0008] Then, this invention person examined this luminescence unit U further. Although the path by the side of upper part opening 6a of the truncated conic luminous-radiation hole 6 formed in the conventional housing 5 from the result of this examination is larger than the wiring substrate 1 side It was the magnitude surrounding the LED chip 3 whole containing metal thin line 4 part which also connected the diameter of hole 6b by the side of a substrate 1 to circuit pattern 2B of the wiring substrate 1, and was fairly large, and the extension include angle theta of the inclined plane (6) to which the openings 6a and 6b of these upper and lower sides are connected was formed small.

[0009] And opening 6a will be reached repeating several reflection for the inside of a reflector 7 to drawing 9, as an arrow head A shows, although incidence is carried out to the reflector 7 where most inclined among the synchrotron orbital radiation from the LED chip 3 in the extension include angle theta of this inclined plane (6) in it being small, since tilt-angle $\theta / 2$ of this reflector 7 are small, and it will emanate out of housing 5. Thus, it turned out that light decreases by diffusion, absorption, etc. that repetitive reflection is repeated in a reflector 7, it serves as weak light compared with the case where it emanates from opening 6a by one reflection, and the brightness of a luminescence side becomes low.

[0010] Then, although enlarging whenever [tilt-angle / of the reflector 7 formed in the above-mentioned housing 5] is also considered The area by the side of a luminescence side is the same, and enlarging opening 6a is the thing of the LED chips 3 and 3 and -- for which a number must be reduced. The thing of the LED chips 3 and 3 which it forms in a substrate 1 clearly conversely that the quantity of light will decrease from old if these LED chips 3 and 3 and -- are reduced, and -- for which a number is increased Whenever [tilt-angle / of that there are problems, such as insulation distance of circuit pattern 2A and 2B, and a reflector 7] becomes smaller, and the thing that neither the quantity of light nor brightness increases comparatively exists.

[0011]

[Problem(s) to be Solved by the Invention] The trouble which it is going to solve is a point that the light which carried out incidence cannot be efficiently emitted to a reflector from opening of housing from an LED chip.

[0012]

[Means for Solving the Problem] The wiring substrate with which the luminescence unit of this invention according to claim 1 arranged two or more LED chips the shape of a straight line, and in the shape of a matrix on the circuit pattern, In the luminescence unit possessing housing which was made to correspond with each LED chip on this wiring substrate, and prepared the luminous-radiation hole It is characterized by the above-mentioned luminous-radiation hole forming successively the nothing slots for metal thin line arrangement connected to the circuit pattern of another side as if opening by the side of the substrate is magnitude which surrounds the LED chip section for the shape of the shape of a truncated cone, and a truncated pyramid.

[0013] The wiring substrate with which the luminescence unit of this invention according to claim 2 arranged two or more LED chips the shape of a straight line, and in the shape of a matrix on the circuit pattern, In the luminescence unit possessing housing which was made to correspond with two or more LED chips which carried out the serial on this wiring substrate, and established the gutter-shaped luminous-radiation object The cross section by the side of a shorter side the above-mentioned luminous-radiation object the shape of the shape of a truncated cone, and a truncated pyramid It is characterized by forming successively the slots for metal thin line arrangement connected to the circuit pattern of another side from each LED chip with the continuous long body to make as if the opening width of face by the side of the substrate is magnitude which surrounds the LED chip section near each LED chip.

[0014] It is characterized by the extension include angle theta of the luminous-radiation hole of

the shape of the shape of a truncated cone which formed the luminescence unit of this invention according to claim 3 in housing, and a truncated pyramid being 20 - 100 degrees.

[0015] The display of this invention according to claim 4 is characterized by providing the current-limiting circuit by which series connection was carried out to 1 set thru/or two or more sets at this luminescence unit in the luminescence unit indicated by either above-mentioned claim 1 thru/or claim 3.

[0016] The display of this invention according to claim 5 is characterized by providing the flashing drive circuit which this luminescence unit is connected [circuit] with 1 set thru/or two or more sets for the luminescence unit indicated by either above-mentioned claim 1 thru/or claim 3 at an output side, and makes two or more LED chips turn on alternatively.

[0017] The lighting system of this invention according to claim 6 is characterized by providing the current-limiting circuit by which series connection was carried out to 1 set thru/or two or more sets at this luminescence unit in the luminescence unit indicated by either above-mentioned claim 1 thru/or claim 3.

[0018] The lighting system of this invention according to claim 7 is characterized by providing the flashing drive circuit which this luminescence unit is connected [circuit] with 1 set thru/or two or more sets for the luminescence unit indicated by either above-mentioned claim 1 thru/or claim 3 at an output side, and makes two or more LED chips turn on alternatively.

[0019]

[Function] Since it considered as the luminous-radiation hole which has the reflector considering opening by the side of the substrate of housing as a minor diameter where whenever [tilt-angle] is large except for the extension part of a metal thin line, light's which carried out incidence to the reflector from the LED chip carrying out repetitive reflection decreases, it can reduce loss, and is efficiently emitted from opening of housing.

[0020]

[Example] Hereafter, the first example of this invention is explained with reference to drawing 1 - drawing 4 . The plan of the important section which set drawing 1 in the perspective view of a luminescence unit, set drawing 2 to drawing 1 , and was seen from D, the sectional view of the important section which traveled through drawing 3 along with X-X-ray in drawing 1 R> 1, and drawing 4 R> 4 are the sectional views of the important section through which it traveled along with the Y-Y line in drawing 1 .

[0021] Sheathing of this luminescence unit U consists of a wiring substrate 1 which consists of synthetic resin of electric insulation, and housing 5 which consists of synthetic resin combined with the whole surface of this wiring substrate 1. For example, circuit pattern 2A to which the dimension beside vertical x is 5cm of about 5cmx abbreviation, and this wiring substrate 1 consists of copper foil etc. on this substrate 1, LED chips 3 and 3 which 2B is formed, separate predetermined spacing, for example, about 5mm, on common circuit pattern 2A in which one side has extended, and consist matrix-like of GaP of 81 every direction [of nine lines] x9 ****, GaAlAs, etc. -- (a drawing top shows only one piece to drawing 2 - drawing 4 .) It has fixed through electroconductive glue.

[0022] Moreover, wiring connection of the epilogue metal thin lines 4 and 4 and -- (a drawing top shows only one to drawing 2 - drawing 4 .) is made in the top face (anode) of independent **** each circuit pattern 2B of another side, 2B, -- (a drawing top shows only one piece to drawing 2 - drawing 4 .), and the above-mentioned LED chips 3 and 3 and --.

[0023] Moreover, Septa 6c and 6c, a total of 81 luminous-radiation holes 6 and 6 divided by --, and -- are formed by the part which meets each LED chips 3 and 3 on a substrate 1, and --, and the medial axis of each luminous-radiation hole 6 has mostly the housing 5 which consists of synthetic resin combined with this wiring substrate 1 on the same axle in the same axle with each LED chips 3 and 3 and --. The peripheral wall of this luminous-radiation hole 6 is the inclined plane which is making the shape of a truncated cone with the large path of opening 6a by the side of the upper part from opening 6b by the side of a substrate 1. Although the path of opening 6a by the side of the upper part is not different from the former by about 4mm, the path of opening 6b by the side of a substrate 1 is a minor diameter from the former in about 1 to the central part of the metal thin line 4 which has extended in independent circuit pattern 2B of

another side from the LED chip 3, and 5mm. As for the extension include angle theta, about 40 degrees and an inclination are loose. Moreover, it notches, the slit-like slot 8 is formed and the above-mentioned metal thin line 4 passes along a part of peripheral wall of this luminous-radiation hole 6 in the luminous-radiation hole 6 and the slot 8 which was open for free passage. Moreover, the reflective film 7 which has light reflex nature, such as white, is formed in the inclined plane of this luminous-radiation hole 6.

[0024] And the assembly of this luminescence unit U forms circuit pattern 2A currently formed successively by copper foil etc. and circuit pattern 2B currently divided, 2B, and -- in the predetermined location on the wiring substrate 1 first, and, subsequently joins the LED chips 3 and 3 and -- through electric conduction adhesives at intervals of predetermined on circuit pattern 2A which is carrying out [above-mentioned] successive formation. between circuit pattern 2Bs, 2Bs, and -- which carried out division formation next with the top face (whether it is on an anode side or it is on a cathode side change LED by pn junction or np junction.) of these LED chips 3 and 3 and -- the metal thin lines 4 and 4 and -- a diameter -- bonding is carried out to next the next and it connects with it. If this bonding is completed, housing 5 will be brought to the top face of the wiring substrate 1, and it will complete by fixing by the means for detachable of the LED chips 3 and 3, the stop by the location, and each luminous-radiation holes 6 and 6, the adhesives of -- which double a location and do not illustrate both and irregularity of --, a **** stop, etc.

[0025] Lighting of this luminescence unit U carries out series connection of the LED chips 3 and 3, --, the current-limiting circuit (not shown) that formed the wiring substrate 1 or the substrate 1 in another object, and is performed by supplying electric power from a power source. When changing a display, moreover, by the flashing drive circuit (not shown) Lighting control of the predetermined LED chips 3 and 3 and -- is carried out for each or every group (in the case of this example, it controls by turning on and off by the side of each circuit pattern 2B.). It functions as a luminescence unit U of a lightning display system by the thing of each of those LED chips 3 and 3 made to turn on and -- for which a predetermined alphabetic character, a figure, an image, etc. are displayed with luminescence combination.

[0026] And if the luminescence unit U of such a configuration is energized and turned on to the predetermined LED chips 3 and 3 and --, the reflected light A which carries out incidence of the light emitted from the LED chip 3 to the direct solar radiation B which goes straight on upwards in drawing, and the reflector 7 formed in the inclined plane of LED chip 3 peripheral wall, and goes out of the luminous-radiation hole 6 will be emitted.

[0027] Since $\theta/2$ is [whenever / tilt-angle / of the inclined plane which the peripheral wall of this luminous-radiation hole 6 forms in the case of this invention] larger than the conventional thing, the synchrotron orbital radiation from the LED chip 3 has that repetitive reflection is repeated [little] in a reflector 7, and most reaches opening 6a in one reflection, and is emitted out of housing 5.

[0028] Therefore, the part which loses light in the inclined plane of the peripheral wall of the luminous-radiation hole 6 is only slot 8 part of the shape of a slit which lets the thin metal thin line 4 pass, if it sees from the whole, they can be few, can raise the quantity of light, brightness, etc. which are emitted from the luminous-radiation hole 6, and can obtain the luminescence unit U whose brightness increased.

[0029] And although at least 1 set of this luminescence unit U can be used, of course For example, as shown in drawing 5, it attaches in the case 9 which has Stanchions 9a and 9a in the shape of a ten sheet x 20-sheet matrix in all directions [units / U / two or more sets of / luminescence] as the traffic information plotting board, and it is a flashing drive circuit (it does not illustrate.). By minding, energizing for a predetermined LED chip and switching it on, display offer of the information required for passing is made.

[0030] Moreover, drawing 6 and drawing 7 show the second example of this invention, give the same sign to the same part as drawing 1 in drawing - drawing 4, and the explanation is omitted. The thing of this example is what made the die length of the side of opening 6a by the side of the upper part the inclined plane of the shape of a truncated pyramid which made larger than opening 6b by the side of a substrate 1 the luminous-radiation holes 6 and 6 formed in housing 5,

and --, the shape of for example, a square drill, and is formed at the larger include angle than before $\theta/2$ whenever [tilt-angle / of the inclined plane to which the openings 6a and 6b of these upper and lower sides are connected].

[0031] Also in the luminous-radiation hole 6 of the shape of this truncated square drill, the medial axis with each LED chips 3 and 3 and -- is on the same axle mostly in the same axle with each luminous-radiation holes 6 and 6 and --. It notches, the slot 8 is formed, the above-mentioned metal thin line 4 passes along a part of peripheral wall of the luminous-radiation hole 6 in the luminous-radiation hole 6 and the slot 8 which was open for free passage, and circuit pattern 2B of another side is not visible from the upper part of the luminous-radiation hole 6 in a tunnel-like slot from the middle of the metal thin line 4.

[0032] Like [in this example] the above-mentioned example, the synchrotron orbital radiation from the LED chip 3 has that repetitive reflection is repeated [little] in a reflector (6), and most reaches opening 6a in one reflection, and is emitted out of housing 5. Therefore, the parts which lose light in the inclined plane (6) of the peripheral wall of the luminous-radiation hole 6 are only few slot 8 parts of the shape of a slit which lets the thin metal thin line 4 pass, and can raise the quantity of light, brightness, etc. to emit.

[0033] Moreover, drawing 8 shows the third example of this invention, gives the same sign to the same part as drawing 1 in drawing - drawing 7 , and the explanation is omitted. although the LED chips 3 and 3 and -- were arranged in the shape of an in-every-direction matrix on the wiring substrate 1 in the above-mentioned example -- the LED chips 3 and 3 of plurality [thing / of this example / top / wiring substrate 1], and -- a serial ---like -- a single tier thru/or a sequence of numbers -- here, single-tier arrangement is carried out. and About housing 5, the luminous-radiation object 61 The cross section by the side of the shorter side corresponding to two or more LED chips 3 and 3 and -- in (it is equivalent to the luminous-radiation hole 6 of the above-mentioned example) is gutter-shaped [which makes a long picture abbreviation reverse Ha typeface by the shape of the shape of a truncated cone, and a truncated pyramid] (however the LED chips 3 and 3 and -- facing a base notching eclipse *****). In each slots 8 and 8 of each LED chips 3 and 3 and -- which were open for free passage, and --, the above-mentioned metal thin lines 4 and 4 and -- pass with the luminous-radiation object 61 by cutting a part of peripheral wall of the luminous-radiation object 61 in near, and forming slots 8 and 8 and --. In addition, 2C in drawing is the electric supply section of common circuit pattern 2A.

[0034] Since the luminous-radiation object 61 with which the luminescence unit U of such a configuration has the reflection property as the above-mentioned example with the same cross section in part was formed, as for the luminescence property, compared with elegance, the high value was shown conventionally.

[0035] In addition, the inclined plane of the luminous-radiation hole 6 of the shape of the shape of a truncated cone which this invention is not limited to the thing of the above-mentioned example, and is formed in housing 5, and a truncated pyramid, or the luminous-radiation object 61 does not have the shape of a perfect straight line. As shown in drawing 8 , you may be straight fields, such as a parabolic curve side and an elliptic curve side. What is necessary is just the structure emitted from the luminous-radiation hole 6 or the luminous-radiation object 61 by the small count of reflection, without the beam of light which went to the inclined plane (6) and the (reflector 7) from the LED chip 3 in short carrying out repetitive reflection of an inclined plane (6) and the (reflector 7). Moreover, according to the trial of this invention person, even if not much large, the diffused light could be carried out, brightness could fall, about 20 - 100 degrees of a luminescence property could improve practically, and the extension include angle of the luminous-radiation hole 6 or the luminous-radiation object 61 was able to aim at the improvement in a property with them especially. [40 - 60 degrees good / condensing nature /, and] [large]

[0036] Moreover, although the reflective film 7 was formed in the peripheral wall of the luminous-radiation hole 6 in the above-mentioned example, especially if housing 5 the very thing is a leucoplast, it is not necessary to form the reflective film 7.

[0037] Moreover, there is little loss of light, the slot 8 which lets the metal thin line 4 formed in the wiring substrate 1 side of the luminous-radiation hole 6 or the luminous-radiation object 61

pass can improve a property, so that width of face is narrow as much as possible, it is not even on the surface of an inclined plane (6), and the thin line 4 whole does not need to be [parts other than the inlet port of a thin line 4 are formed in the shape of a tunnel, and] seen [the slot / this slot 8] from the upper part.

[0038] Moreover, although the example described the display and luminescence unit for a traffic information display The small thing shown in the third example OA machine dexterity, such as a copying machine and facsimile, The object for cars or the objects for an ornament, such as a stop lamp, the object for the lighting of an exhibit, etc. are sufficient. Moreover, at least 1 set, the luminescence unit U shown in the second and 3 example unifies two or more sets, and can apply them widely irrespective of the outside of indoor as objects for a display, such as various electrical scoreboards, a guide plate, an indicator, and an advertising display.

[0039] Furthermore, even if it arranges a transparence protector, a coloring object, a lens, a filter, etc. for protection on the occasion of use of this luminescence unit U to the luminous-radiation holes 6 and 6 of housing 5, and the luminous-radiation side which — overlooks, it does not interfere.

[0040] Since the assembly procedure of this luminescence unit U etc. should just only form not only an example but the slot for metal thin lines in the housing side, it does not have the ***** activity top former and any change in an exceptional process further again.

[0041]

[Effect of the Invention] As explained in full detail above, as for this invention, the synchrotron orbital radiation from an LED chip (light emitting diode chip) has that repetitive reflection is repeated [little] in respect of the peripheral wall of a luminous-radiation hole or a luminous-radiation object. Since it considered as the configuration to which most reaches opening of a luminous-radiation hole in one reflection, and is emitted out of housing 5 therefore, the quantity of light, brightness, etc. which are emitted from a luminous-radiation hole can be raised, and the luminescence unit and display whose brightness increased, and a lighting system can be obtained.

[0042] Moreover, since quantity of an LED chip is not increased and it can manufacture by the activity as usual when a housing front face is made into the same luminescence area, it has various advantages — it is [cost] easy and it is made.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is the perspective view showing the first example of the luminescence unit of this invention.

[Drawing 2] It is the plan expanding and showing one luminous-radiation pore seen from the Z direction in drawing 1 .

[Drawing 3] It is the front view expanding and showing the field which cut one luminous-radiation pore along with X-X-ray in drawing 1 .

[Drawing 4] It is the side elevation expanding and showing the field which cut one luminous-radiation pore along with the Y-Y line in drawing 1 .

[Drawing 5] It is the perspective view showing the example of the display of this invention.

[Drawing 6] It is the perspective view showing the second example of the luminescence unit of this invention.

[Drawing 7] It is the plan expanding and showing one luminous-radiation pore seen from the Z direction in drawing 6 .

[Drawing 8] It is the perspective view showing the third example of the luminescence unit of this invention.

[Drawing 9] It is the plan expanding and showing the important section of the conventional luminescence unit.

[Description of Notations]

U: Luminescence unit

1: Wiring substrate

2A, 2B: Circuit pattern

3: LED chip (light emitting diode chip)

4: Metal thin line

5: Housing

6: Luminous-radiation hole (inclined plane)

61: Luminous-radiation object (inclined plane)

6a, 6b: Opening

7: Reflector

8: Slot (slit)

theta: Extension include angle

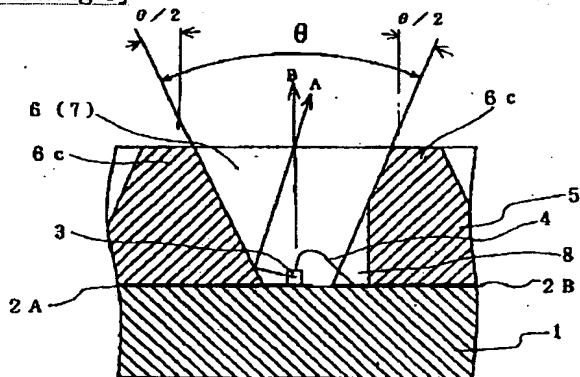
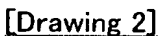
theta/2: Whenever [tilt-angle / of an inclined plane]

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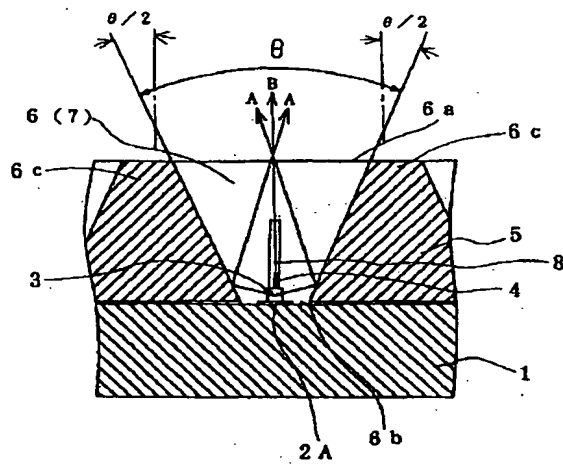
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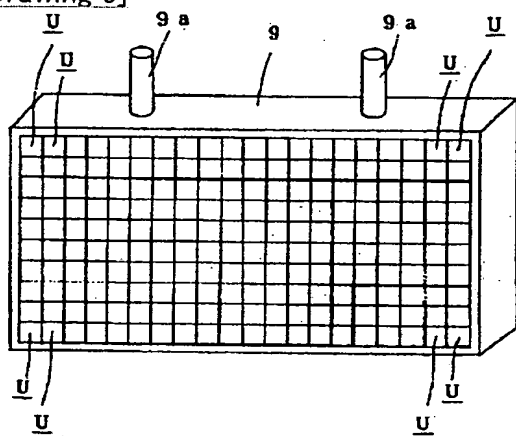
[Drawing 1]



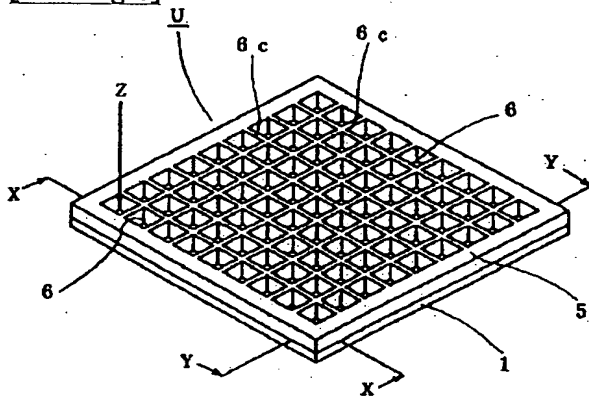
[Drawing 4]



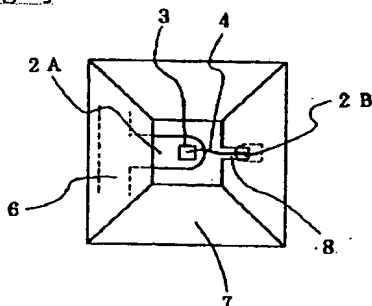
[Drawing 5]



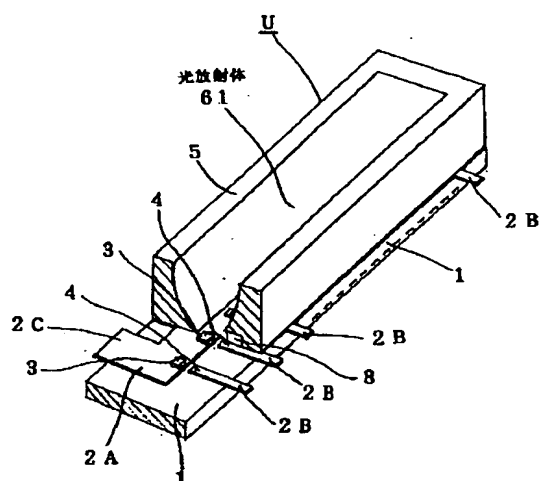
[Drawing 6]



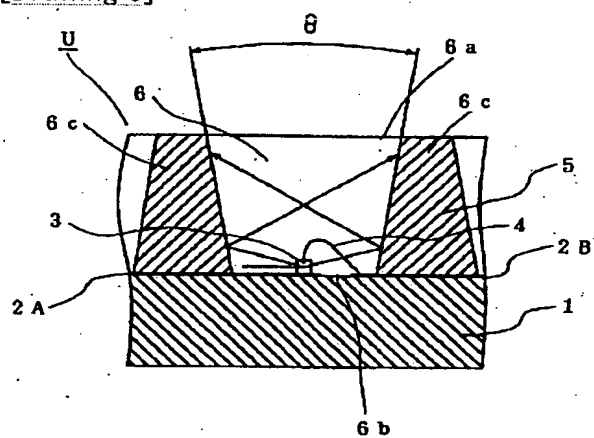
[Drawing 7]



[Drawing 8]



[Drawing 9]



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3. In the drawings, any words are not translated.

CORRECTION OR AMENDMENT

[Kind of official gazette] Printing of amendment by the convention of 2 of Article 17 of Patent Law

[Section partition] The 2nd partition of the 6th section

[Publication date] August 3, Heisei 13 (2001. 8.3)

[Publication No.] JP,7-199829,A

[Date of Publication] August 4, Heisei 7 (1995. 8.4)

[Annual volume number] Open patent official report 7-1999

[Application number] Japanese Patent Application No. 5-335260

[The 7th edition of International Patent Classification]

G09F 9/33

F21V 19/00

H01L 33/00

[FI]

G09F 9/33

F21V 19/00 P

H01L 33/00 N

[Procedure revision]

[Filing Date] August 30, Heisei 12 (2000. 8.30)

[Procedure amendment 1]

[Document to be Amended] Specification

[Item(s) to be Amended] 0008

[Method of Amendment] Modification

[Proposed Amendment]

[0008] Then, this invention person examined this luminescence unit U further. The truncated conic luminous-radiation hole 6 formed in the conventional housing 5 from the result of this examination is metal thin line 4 part which also connected the diameter of hole 6b by the side of a substrate 1 to circuit pattern 2B of the wiring substrate 1 although the path by the side of upper part opening 6a was larger than the wiring substrate 1 side. It was the magnitude surrounding the LED chip 3 included whole, and was fairly large, and the extension include angle theta of the inclined plane to which the openings 6a and 6b of the upper and lower sides of the luminous-radiation hole 6 are connected was formed small.

[Procedure amendment 2]

[Document to be Amended] Specification

[Item(s) to be Amended] 0009

[Method of Amendment] Modification

[Proposed Amendment]

[0009] And opening 6a will be reached repeating several reflection for the inside of a reflector 7

to drawing 9, as an arrow head A shows, although incidence is carried out to the reflector 7 where most inclined among the synchrotron orbital radiation from the LED chip 3 in the extension include angle theta of the inclined plane of this luminous-radiation hole 6 in it being small, since tilt-angle theta / 2 of this reflector 7 are small, and it will emanate out of housing 5. Thus, it turned out that light decreases by diffusion, absorption, etc. that repetitive reflection is repeated in a reflector 7, it serves as weak light compared with the case where it emanates from opening 6a by one reflection, and the brightness of a luminescence side becomes low.

[Procedure amendment 3]

[Document to be Amended] Specification

[Item(s) to be Amended] 0014

[Method of Amendment] Modification

[Proposed Amendment]

[0014] The luminescence unit of this invention according to claim 3 is characterized by the extension include angle theta of the luminous-radiation hole of the shape of the shape of a truncated cone formed in housing and a truncated pyramid being 20 - 100 degrees.

[Procedure amendment 4]

[Document to be Amended] Specification

[Item(s) to be Amended] 0020

[Method of Amendment] Modification

[Proposed Amendment]

[0020]

[Example] Hereafter, the first example of this invention is explained with reference to drawing 1 - drawing 4. The plan of the important section which set drawing 1 in the perspective view of a luminescence unit, set drawing 2 to drawing 1, and was seen from the Z direction, the sectional view of the important section which traveled through drawing 3 along with X-X-ray in drawing 1, and drawing 4 are the sectional views of the important section through which it traveled along with the Y-Y line in drawing 1.

[Procedure amendment 5]

[Document to be Amended] Specification

[Item(s) to be Amended] 0032

[Method of Amendment] Modification

[Proposed Amendment]

[0032] Like [in this example] the above-mentioned example, the synchrotron orbital radiation from the LED chip 3 has that repetitive reflection is repeated [little] in the sloping reflector 7, and most reaches opening 6a in one reflection, and is emitted out of housing 5. Therefore, the parts which lose light in the reflector 7 of the peripheral wall of the luminous-radiation hole 6 are only few slot 8 parts of the shape of a slit which lets the thin metal thin line 4 pass, and can raise the quantity of light, brightness, etc. to emit.

[Procedure amendment 6]

[Document to be Amended] Specification

[Item(s) to be Amended] 0035

[Method of Amendment] Modification

[Proposed Amendment]

[0035] In addition, this invention is not limited to the thing of the above-mentioned example, and the inclined plane of the luminous-radiation hole 6 of the shape of the shape of a truncated cone formed in housing 5 and a truncated pyramid or the luminous-radiation object 61 should be shown in drawing 8 instead of the shape of a perfect straight line. To be straight fields, such as a parabolic curve side and an elliptic curve side, and what is necessary is just the structure emitted by the small count of reflection from opening 6a of the luminous-radiation hole 6 or the luminous-radiation object 61, without the beam of light which went to the reflector 7 where the luminous-radiation hole 6 and the luminous-radiation object 61 inclined from the LED chip 3 in short carrying out repetitive reflection of the inclined plane (reflector 7). Moreover, according to the trial of this invention person, even if not much large, the diffused light could be carried out, brightness could fall, about 20 - 100 degrees of a luminescence property could improve

practically, and the extension include angle of the luminous-radiation hole 6 or the luminous-radiation object 61 was able to aim at the improvement in a property with them especially. [40 - 60 degrees good / condensing nature /, and] [large]

[Procedure amendment 7]

[Document to be Amended] Specification

[Item(s) to be Amended] 0037

[Method of Amendment] Modification

[Proposed Amendment]

[0037] Moreover, there is little loss of light, the slot 8 which lets the metal thin line 4 formed in the wiring substrate 1 side of the luminous-radiation hole 6 or the luminous-radiation object 61 pass can improve a property, so that width of face is narrow as much as possible, it is not even on the surface of an inclined plane, and the thin line 4 whole does not need to be [parts other than the inlet port of a thin line 4 are formed in the shape of a tunnel, and] seen [the slot / this slot 8] from the upper part.

[Procedure amendment 8]

[Document to be Amended] Specification

[Item(s) to be Amended] Explanation of a sign

[Method of Amendment] Modification

[Proposed Amendment]

[Description of Notations]

U: Luminescence unit

1: Wiring substrate

2A, 2B: Circuit pattern

3: LED chip (light emitting diode chip)

4: Metal thin line

5: Housing

6: Luminous-radiation hole

61: Luminous-radiation object

6a, 6b: Opening

7: Reflector

8: Slot (slit)

theta: Extension include angle

theta/2: Whenever [tilt-angle / of an inclined plane]

[Procedure amendment 9]

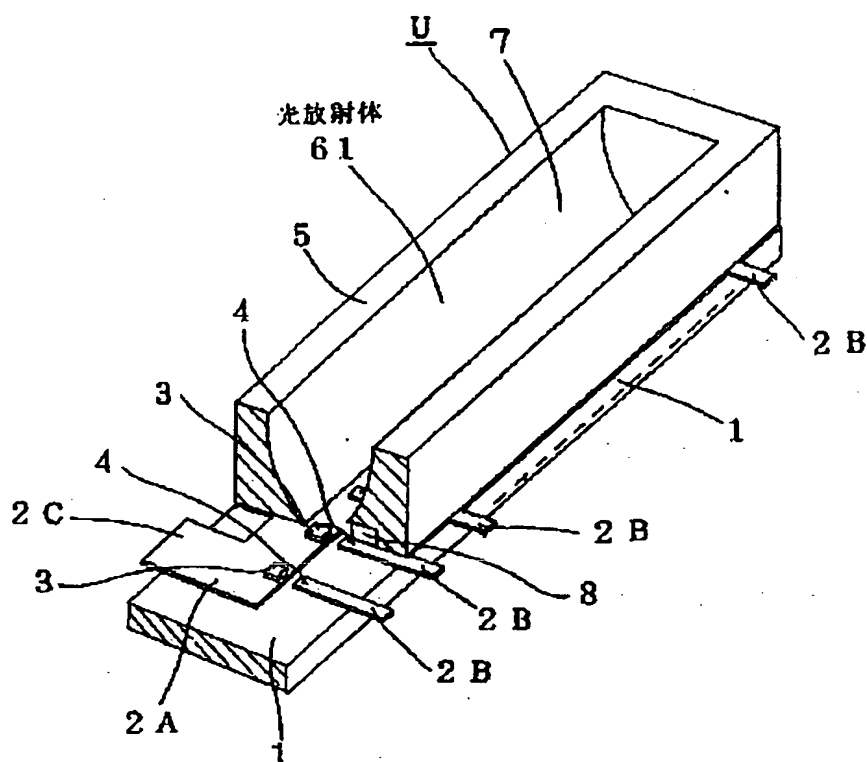
[Document to be Amended] DRAWINGS

[Item(s) to be Amended] drawing 8

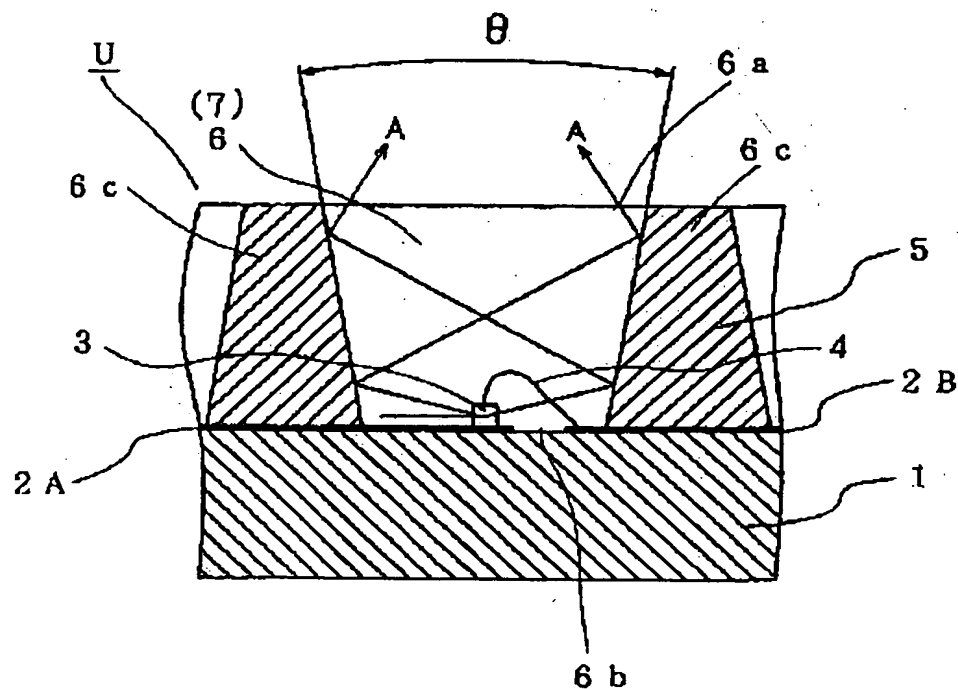
[Method of Amendment] Modification

[Proposed Amendment]

[Drawing 8]



[Procedure amendment 10]
[Document to be Amended] DRAWINGS
[Item(s) to be Amended] drawing 9
[Method of Amendment] Modification
[Proposed Amendment]
[Drawing 9]



[Translation done.]